Hydrodynamic clutch

The invention relates to a hydrodynamic clutch with the characteristics detailed in the preamble of claim 1, of which the maximum torque that it can picked up can be influenced.

From the state of the art, hydrodynamic clutches in start-up units for vehicles are known in a multitude of implementations. The start-up unit comprises thereby a drive that can be coupled to an input and an output that can be coupled to a power take-off. The hydrodynamic clutch which comprises a primary impeller and a secondary impeller, that together form a toroidal working chamber, is arranged between the input and the output. The primary impeller is thereby, for example, provided with a so-called primary wheel cup that is torque proof connected to it and that encloses the secondary impeller in the axial direction and completely in the circumferential direction. In addition, the start-up unit comprises a controllable clutch in the form of a direct-drive clutch that is arranged parallel to the hydrodynamic components, in particular the clutch, and that can be controlled together with it or on its own. This means that through both clutches two power branches are created, whereby the power flux either takes place only through one of the clutches or collectively through both. The controllable clutch comprises thereby at least a clutch input element and a clutch output element, whereby the clutch output element is coupled, at least indirectly torque proof, to the secondary impeller. The input clutch element is connected, at least indirectly torque proof, with the primary wheel and/or the input. The means for the creation of a frictional contact between the individual clutch elements comprise thereby a piston element that can be impacted by a pressure medium. Said means can be arranged separately from the clutch disks or else formed directly on the secondary impeller in particularly compact implementations. The hydrodynamic clutch is in addition provided with a utilities supply system. The clutch can thereby be flowed through centrifugally and centripetally. In the case of centripetal flow-through

for the state of the art reference is made to the following publications:

DE1 196 438 B
US 2 851 858 A
US 2 683 350 A.

The characteristics known from the first mentioned document are summarized in the preamble of claim 1.

Patent Claims

1. Hydrodynamic clutch (1; 1.2; 1.3a; 1.3b; 1.3c; 1.4a; 1.4b);

1.1 with a primary impeller (2; 2.2; 2.3a; 2.3b; 2.3c; 2.4; 2.4a; 2.4b) and a secondary impeller (3; 3.2a; 3.3a; 3.3b; 3.3c; 3.4; 3.4a; 3.4b), which form together a working chamber (4; 4.2; 4.3a; 4.3b; 4.3c; 4.4; 4.4a; 4.4b);

1.2 with means for the influencing of the transmission ratio of the hydrodynamic clutch (1; 1.2; 1.3a; 1.3b; 1.3c; 1.4a; 1.4b), in particular for the influencing of the circulation flow in the working chamber (4; 4.2; 4.3a; 4.3b; 4.3c; 4.4; 4.4a; 4.4b), comprising at least an element (5; 5.2; 5.3a; 5.3b; 5.3c; 5.4a; 5.4b; 5.5) which forms an interference or baffle region, that extends at least partly into the working chamber (4; 4.2; 4.3a; 4.3b; 4.3c; 4.4; 4.4a; 4.4b);

1.3 the element (5; 5.2; 5.3a; 5.3b; 5.3c; 5.4a; 5.4b; 5.5) which forms the interference or baffle region is displaceable in the axial direction in the working chamber (4; 4.2; 4.3a; 4.3b; 4.3c; 4.4; 4.4a; 4.4b); characterized by the following feature:

1.4. the element which forms the interference or baffle region is constructed as a ring shaped disk element or else as a washer segment, of which the sides that point away from each other are arranged parallel to each other.

2. Hydrodynamic clutch (1.5) according to claim 1, characterized by that the front side, which points in between the impellers (25, 35) to the parting plane, is constructed with an inclination over at least a part of its radial extension in the radial direction to the central diameter of the working chamber (8.5).

3. Hydrodynamic clutch (1.5) according to claim 2, characterized by that the front side, which

points in between the impellers (2.5; 3.5) to the parting plane, is constructed uneven in the radial direction to the central diameter of the working chamber (8.5), in particular curved.

4. Hydrodynamic clutch (1; 1.2; 1.3a; 1.4a) according to one of the claims 1 to 3, characterized by that the element (5; 5.2; 5.3a; 5.4a) which forms an interference or baffle region is arranged, seen in the radial direction, in the region of the external diameter (d_{A4}) of the working chamber (4.3b, 4.4b) and comprises an internal diameter (d_{15}) that is larger than the internal diameter (d_{14}) of the working chamber (4; 4.2; 4.3a; 4.4a).

5. Hydrodynamic clutch (1.3b; 1.4b) according to one of the claims 1 to 3, characterized by that the element (5.3b; 5.4b) which forms an interference or baffle region is arranged in the region of the internal diameter (d_{14}) of the working chamber (4.3b, 4.4b) and by that its external diameter (d_{A5}) is smaller than the external diameter (d_{A4}) of the working chamber (4.3b; 4.4b).

6. Hydrodynamic clutch (1; 1.2; 1.3a; 1.3b; 1.3c; 1.4a; 1.4b);

6.1 with a primary impeller (2; 2.2; 2.3a; 2.3b; 2.3c; 2.4; 2.4a; 2.4b) and a secondary impeller (3; 3.2a; 3.3a; 3.3b; 3.3c; 3.4; 3.4a; 3.4b), which form together a working chamber (4; 4.2; 4.3a; 4.3b; 4.3c; 4.4; 4.4a; 4.4b);

6.2 with means for the influencing of the transmission ratio of the hydrodynamic clutch (1; 1.2; 1.3a; 1.3b; 1.3c; 1.4a; 1.4b), in particular for the influencing of the circulation flow in the working chamber (4; 4.2; 4.3a; 4.3b; 4.3c; 4.4; 4.4a; 4.4b), comprising at least an element (5; 5.2; 5.3a; 5.3b; 5.3c; 5.4a; 5.4b; 5.5) which forms an interference or baffle region, that extends at least partly into the working chamber (4; 4.2; 4.3a; 4.3b; 4.3c; 4.4; 4.4a; 4.4b);

6.3 the element (5; 5.2; 5.3a; 5.3b; 5.3c; 5.4a; 5.4b; 5.5) which forms the interference or baffle region is displaceable in the axial direction in the working chamber (4; 4.2; 4.3a; 4.3b; 4.3c; 4.4; 4.4a; 4.4b);

6.4 the element (5; 5.3a; 5.3b) which forms the interference or baffle region is assigned to one of the two impellers (2; 2.3a; 2.3b; 3; 3.3a; 3.3b), whereby the impeller comprises a baffle carrying part (8; 8.3a; 8.3b) which contains a, in the axial direction displaceable and the flow circulation guiding wall region (7) and by that the element (5; 5.3a; 5.3b) which forms the baffle and interference region forms a structural unit with this wall region (7).

7. Hydrodynamic clutch (1; 1.3a; 1.3b) according to claim 6, characterized by that the element (5; 5.3a; 5.3b) which forms the baffle or interference region forms with the axially displaceable wall region (7) an integral unit.

8. Hydrodynamic clutch (1; 1.2; 1.3c; 1.4; 1.5) according to the claims 1 to 5, characterized by that the element (5; 5.2; 5.3c; 5.4; 5.5) which forms the interference or baffle region is constructed as a separate component.

9. Hydrodynamic clutch (1; 1.2; 1.3c; 1.4; 1.5), according to claim 8, characterized by the following features:

9.1 the element (5; 5.2; 5.3c; 5.4; 5.5) which forms the interference or baffle region is assigned to an impeller (2; 2.2; 2.3c; 2.4; 2.5; 3; 3.2; 3.3c; 3.4; 3.5);

9.2 the impeller (2; 2.2; 2.3c; 2.4; 2.5; 3; 3.2; 3.3c; 3.4; 3.5) contains a baffle carrying part;

9.3 the baffle carrying part (8; 8.2; 8.3c; 8.4; 8.5) extends, viewed in the radial direction, always only over a part of the extension of the individual baffles in this direction.

9.4 the blades of the blading (14) freely project in the radial direction in the region of the internal diameter (d_{14}) or the external diameter (d_{A8}) of the working chamber (4; 4.2; 4.3c; 4.4; 4.5) in the region that is free from the blade carrying part (8; 8.2; 8.3c; 8.4; 8.5) with its in radial direction oriented end regions (13.1);

9.5 the element which forms the interference or baffle region (5; 5.2; 5.3c; 5.4; 5.5) contains on the external circumference or the inner circumference guidance slits (16) for the guidance of the blades of the blading (14) which are arranged adjacent to each other in the circumferential direction.

10. Hydrodynamic clutch (1; 1.2; 1.3c; 1.4; 1.5), according to claim 8, characterized by the following features:

10.1 the element (5.3a; 5.3c; 5.4; 5.5) which forms the interference or baffle region is assigned one of the impellers (2.3; 2.3a; 3.3a; 2.3c; 3.3c; 2.5; 3.5);

10.2 the impeller contains a blade carrying part;

10.3 the blade carrying part (8.3a; 8.3c; 8.4) and the blading (14.3a; 14.3c; 14.4), seen in the radial direction, are characterized at the internal diameter (d_1) or the external diameter (d_A) of the respective impeller (2.3; 2.3a; 3.3a; 2.3c; 3.3c; 2.5; 3.5) by a constant diameter over the axial extension, whereby this is formed by the shaping of a blade part segment with the pertinent sub region of the blade carrying part.

11. Hydrodynamic clutch (1; 1.2; 1.3a; 1.3b; 1.3c; 1.4a; 1.4b) according to one of the claims 8 to 10, characterized by that the element (3; 3.2a; 3.3a; 3.3b; 3.3c; 3.4; 3.4a; 3.4b) which forms an interference or baffle region is guided at the respective impeller (2; 2.2; 2.3b; 2.3c; 2.4; 2.4a; 2.4b; 3; 3.2a; 3.3a; 3.3b; 3.3c; 3.4; 3.4a; 3.4b) or an element that is coupled torque proof to it.PG 06179WO / PCT/EP2004/012701

12. Hydrodynamic clutch (1; 1.2; 1.3a; 1.3b; 1.3c; 1.4a; 1.4b) according to one of the claims 8 to 10, characterized by that the element (5; 5.2; 5.3a; 5.3b; 5.3c; 5.4a; 5.4b; 5.5) which forms an interference or baffle region is guided by an element which rotates relative to the impeller (2; 2.2; 2.3a; 2.3b; 2.3c; 2.4; 2.4a; 2.4b; 3; 3.2a; 3.3a; 3.3b; 3.3c; 3.4; 3.4a; 3.4b) or an element that is coupled torque proof to it.

13. Hydrodynamic clutch (1; 1.2; 1.3a; 1.3b; 1.3c; 1.4a; 1.4b) according to one of the claims 8 to 10, characterized by that the element (5; 5.2; 5.3a; 5.3b; 5.3c; 5.4a; 5.4b; 5.5) which forms an interference or baffle region is guided at a stationary component or casing (21, 24, 25) or by an element which is coupled torque proof to an impeller (2; 2.2; 2.3a; 2.3b; 2.3c; 2.4; 2.4a; 2.4b; 3; 3.2a; 3.3a; 3.3b; 3.3c; 3.4; 3.4a; 3.4b).

14. Hydrodynamic clutch (1; 1.2; 1.3b; 1.4b; 1.5; 1.6) according to the claims 1 to 13, characterized by that the element (5; 5.2; 5.3b; 5.4b; 5.5; 5.6) which forms the interference or baffle region is assigned to the primary impeller (2; 2.2; 2.3b; 2.4b; 2.5; 2.6).

15. Hydrodynamic clutch (1.3a; 1.4a) according to one of the claims 1 to 14, characterized by that the element (5.3a; 5.4a) which forms the interference or baffle region is assigned to the secondary impeller (3.3a; 3.4).